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FORMS OF BACTERIA ON THE NORMAL EYE.

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The practical advantages of the microscope are perhaps nowhere more clearly shown than in the study of disease germs. During the past ten or fifteen years the treatment of wounds has been revolutionized and the great aim of the surgeon is to successfully combat the minute forms of life which effects the wounds he treats. Antisepsis, depends for its data upon the microscope, and the culture tube, and in no department is this more thoroughly exemplified than in the different diseases which infect the outer portion of the eye, especially the conjunctiva and the cornea. It is almost needless to say in explanation that the conjunctiva is a mucous membrane which covers the outer portion of the globe of the eye and then, being reflected on the inner surface of the lids, conjoins the globe with the lids, and therefore called the conjunctiva. The cornea is also well known as the transparent portion of the outer covering of the globe. As these two portions of the eye are constantly exposed to the air, and as they are also moist and warm, it is not surprising that they serve an excellent bed in which all, or at least many of the germs which constantly float in the atmosphere, should readily grow. Moreover, as the conjunctiva is connected with the nostrils by means of the tear-duct, and as the eye is constantly brought in contact with the fingers, towels and foreign substances, it is not surprising that a large variety of germs of different kinds should find lodgement there. In reality, this is the case, and an examination of these two portions of the outer part of the eye shows that they contain various minute forms of life, some of which are almost constantly present on the eye in its normal condition, and others are often there, either as a cause or as a result of disease. The former may be considered as the bacteria of the normal eye. The latter may be called pathological bacteria. A description of the varieties or species found there has been given from time to

time in the various articles which have appeared upon the subject, but I am not aware that anyone has attempted to arrange the different forms in any manner more or less systematic. It is the object of this paper to bring together a few of these facts connected with the bacteria of the normal eye and to make a partial list of them. Moreover, it seemed useless to consider any of the forms pertaining to the diseased eye until those are clearly defined which have been already described existing there in its normal condition. It should be stated that this list is simply a re-arrangement of the facts given by A. Eugene Fick in his monograph entitled "Micro Organisms on the Conjunctiva," and to this I shall venture to add one or two forms observed by myself. In arranging these it has seemed best to follow the plan suggested by Eisenberg, not only because that it is very excellent in itself, but also because it furnishes a basis of comparison.

BACILLUS A.

<i>Form</i> -----	Parallelogram with rounded edges.
<i>Size</i> -----	Length very variable 1.6μ to 6.8μ average 2 m. 3 m. x 1.
<i>Color</i> -----	Slight halo (?) surrounding them.
<i>Arrangement</i> -----	Decided tendency to the formation of chains 10-40. (?)
<i>Motion</i> -----	Movable when in hanging drops.
<i>Staining</i> -----	Gram's—greater part remains deep blue.
<i>Gelatine</i> -----	<div> { Slowly—After weeks a line of white points in track of needle. { Very slowly liquifying above. { Spores appear slowly if at all. </div>
<i>Agar</i> -----	<div> { After 24 hours thin, white scum, and white line in track of needle. { After six days a thick layer. </div>
<i>Blood serum</i> -----	<div> { After five hours, grey spots with undefined edges. { Under hand glass appears as a network resembling bone, the threads being strings of bacilli. { Outer zone of colony made of bacilli, easily stained. { Middle zone of colony made of bacilli, not easily stained, and ragged. { Inner zone of colony made of bacilli, impossible to stain. </div>

<i>Potato</i> -----	{ Rapid, after one day, colonies well marked. { After two days, colonies appear like a layer of pus, the potato being dirty, almost dark red. { Bacilli large.
<i>Influence of Temperature</i>	Grows most rapidly at thirty-five degrees.
<i>Rapidity of Growth</i>	Exceedingly rapid.
<i>Fructification</i> -----	{ In the inner or middle zone of plate cultures. {
<i>Inoculation</i> -----	{ Inoculation into the cornea of rabbits, non-pathogenic. { After one to six days, acute inflammation, which subsides entirely.

BACILLUS B.

<i>Form</i> -----	Long and thin.
<i>Size</i> -----	Length 1.6—6 x 0.5 to 0.8 μ .
<i>Color</i> -----	Halo usually.
<i>Arrangement</i> -----	Chains or threads.
<i>Motion</i> -----	Not movable.
<i>Staining</i> -----	Does not color by Gram's method.
<i>Gelatine</i> -----	{ With difficulty. { 4 Days—Small liquified spot. { Zeiss one-twelfth 3 x 1.6 to 3.0 x 0.5. { No spores visible.
<i>Agar</i> -----	{ 1st Day—Grayish white scum. { 2d Day—Grayish white scum, thicker. { Zeiss one-twelfth, 1.4—2 x 0.6.—0.8 μ { Slight tendency to spore formation.
<i>Blood serum</i> -----	{ PLATE. { 1st Day—Thick membranous deposit, edges sharp. { Condensation water turbid. { 2 Days—No larger. { Zeiss one-twelfth, 1.6 to 2.0 x 0.6 to 0.8 μ . { Club-shaped and with complete spores.
<i>Potato</i> -----	{ With difficulty—very like Bacillus A. { Zeiss one-twelfth, 2.0 to 5.0 x 0.4 to 0.6 μ . { No spores visible at first. { Dif. Diag.—From "luft blaschen" Bacillus. { Think it is like Weeks' Bacillus.

BACILLUS C.

Pure Culture could not be obtained.

BACILLUS D.—(Proteus Vulgaris (?).)

<i>Form</i> -----	Small, thin, corners rounded square.
<i>Size</i> -----	1 to 2.4 x 0.4 to 0.7 μ .
<i>Motion</i> -----	None.
<i>Staining</i> -----	{ Concentrated methylviolet, stains easily. Gram's method removes color.
<i>Gelatine</i> -----	{ PUNCTURE. 1 Day—Temperature of room, distinct colony. 2 Days—Liquifaction of gelatine. Deposit at bottom of glass. Odor of decomposition, 1.6 x 0.6 μ . 10 Days—Not only the bacilli but rounded bodies 0.7 μ diam.
<i>Agar</i> -----	{ PUNCTURE. 1 Day—Visible. 2 Days—Indistinct line. Odor slight. 1 to 1.2 x 0.4 to 0.5 μ . Also many small, round bodies 0.5 to 0.7 μ . PLATE. 1 Day—Numerous colonies, dark point in the centre, lighter at the edges. Slight enlargements, centre yellow, then a lighter zone and irregular edges. 3 Days—The bacilli have disappeared largely, and instead whitish bodies 0.5 to 0.7 μ in diameter.
<i>Blood serum</i> -----	{ PLATE. Rapidly. 18 hours. Greasy, watery deposit. Condensation water turbid. Odor slight. Becomes fœtid. 1.6 to 2.0 x 0.4 to 0.5 μ . Also small, round bodies, often double.
<i>Potato</i> -----	{ Yellowish, liquified deposit. Odor stinking and fœtid. 5 Days—creamy, greasy scum. 1.2 to 2 x 0.4 to 0.5 μ . None of the small, round bodies, but these appear if inoculation is made into agar or gelatine.

Inoculation----- { From an agar culture, into cornea of rabbit, produces ulcer-perforation.
 { From gelatine, reaction slight.

BACILLUS E.—(B. *Flourescens*, *Liquefaciens*).

Form-----Variable. Corners unusually sharp.

Size-----Variable. 0.8 to 2.4 x 0.4 to 0.6 μ .

Motion-----No motion.

Staining----- { Stains with concentrated methylviolet solution.
 { Stains removed by Gram's method.

Gelatine----- { PUNCTURE or PLATE, not stated.
 { 2 Days—A nail-shaped colony. The head being of a greenish yellow, toothed.
 { With slight enlargement, the head appears covered with a thin scum.

Agar----- { Grows also at temperature of room.
 { 2 Days—The growth then arrested and color becomes diffused in the agar mass.
 { 1.6 x 0.4 μ .

Blood serum-----Cultures not successful.

Potato-----Cultures not successful.

Pathogenesis-----Not pathogenic.

BACILLUS F.

Form-----Like a coccus. Elliptical.

Size-----1.4 to 1.7 x 0.8 to 1 μ . Variations slight.

Color-----Halo distinct.

Motion-----No motion.

Staining----- { Stains with methylviolet. Removed by Grams' method.

Gelatine----- { PUNCTURE.
 { 1 Day—Nail form, with yellow head.
 { Does not liquify.

Agar-----As with gelatine.

Blood Serum-----No result.

Potato-----Frequent failures.

Inoculation----- { Into cornea of rabbit.
 { A tedious, moderate inflammation, spreading to iris, usually with ulceration of the cornea.

It is not considered that this list is by any means complete, but it is hoped that at a future meeting it will be possible to present similar details concerning other forms found on the normal conjunctiva. Especially is it desirable to ascertain more exactly the nature of those varieties inhabiting the conjunctiva when in a state of inflammation, as, for example, in conjunctivitis purulenta. That some such contagium does exist in the pus, there can be but little doubt, as inoculation so frequently reproduces the disease. (This was illustrated by a patient present.) But whether the bacterium is the gonococcus of Neisser, or the form described by Michel, or still some other, is yet an open question.